(19)日本国特許庁（ＪＰ）　(12)特　許　公　報（Ｂ２）　(11)特許番号

第2944042号

(45)発行日　平成11年(1999)８月30日　(24)登録日　平成11年(1999)６月25日

(51)Int.Cl.[6]	識別記号	ＦＩ
Ｇ１０Ｈ　1/34		Ｇ１０Ｈ　1/34

請求項の数２(全　８　頁)

(21)出願番号　特願平1－245841

(22)出願日　平成１年(1989)９月21日

(65)公開番号　特開平3－107900

(43)公開日　平成３年(1991)５月８日

審査請求日　平成８年(1996)９月24日

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(58)調査した分野(Int.Cl.[6]，ＤＢ名)
G10H　1/34

(54)【発明の名称】　電子打楽器

1

(57)【特許請求の範囲】

【請求項１】演奏者が打撃を与える打面と、
この打面の下面に張り合わせた第１の電極と、
この第１の電極の下面に張り合わせられ、上記打面への打撃強度に応じて抵抗値が変化する感圧抵抗素子と、
この感圧抵抗素子の下部に設けた抵抗面と、
この抵抗面に設けられ、上記打面への打点位置に応じて互いの間の抵抗値の比率が変化する第２及び第３の電極とを、
具備する電子打楽器。

【請求項２】請求項１記載の電子打楽器において、第２及び第３の電極にそれぞれ固定抵抗器の一端を接続し、他端を相互に接続し、第１の電極と上記固定抵抗器の相互接続点との間に定電流源を接続し、上記固定抵抗器間の電圧及び上記定電流源間の電圧に基づいて打点位置及び打撃強度を検出する電子打楽器。

2

【発明の詳細な説明】

[産業上の利用分野]

本発明は、電子打楽器に関し、特に打撃強度と打撃位置とを検出するものに関する。

[従来の技術]

従来、電子打楽器において、打撃位置を検出するものとしては、例えば実公昭52－46731号公報、特開昭56－126893号公報に開示されているようなものがある。実公昭52－46731号公報の技術は、面抵抗体と導電膜とを間隔を隔てて配置し、導電膜を打撃して、導電膜を面抵抗体に接触させることによって、導電膜と面抵抗体との間の抵抗値を変化させて、打撃位置を検出するものである。また、特開昭56－126893号公報の技術は、複数の打撃位置検出用のセンサを設け、これらのいずれが打撃さ

れたかによって打撃位置を検出するものである。また、打撃位置と打撃強度とを検出するものとしては、特表昭62－501653号公報に開示されているものがある。これは、下から順に導電層、感圧素子、抵抗シートを積層し、打撃位置の検出は、抵抗シートを打撃した際の抵抗シートの抵抗値の変化によって検出し、打撃強度の変化は感圧素子の抵抗変化によって検出するものである。

［発明が解決しようとする課題］

しかし、実公昭52－46731号公報、特開昭56－126893号公報の技術によれば、打撃位置の検出はできるが、打撃強度の検出はできないという問題点があった。また、特表昭62－501653号公報の技術によれば、打撃強度と打撃位置とを検出することはできるが、単一方向（例えばＸ－Ｘ′方向）のみしか打撃位置を検出できないため、実用的ではなく、他の方向（例えばＹ－Ｙ′方向）の打撃位置を検出することができないという問題点があった。また、打撃強度や打撃位置の検出は、抵抗シートや感圧素子の抵抗値の変化を検出することによって行なっているが、そのため、打撃位置検出用の電源と打撃強度検出用の電源とが個別に必要であり、回路構成が複雑になるという問題点もあった。

本発明は上記の各問題点を解決した電子打楽器を提供することを目的とする。

［課題を解決するための手段］

上記の目的を達成するために、本発明は、演奏者が打撃を与える打面と、この打面の下面に張り合わせた第１の電極と、この第１の電極の下面に張り合わせられ、上記打面への打撃強度に応じて抵抗値が変化する感圧抵抗素子と、この感圧抵抗素子の下部に設けた抵抗面と、この抵抗面に設けられ、上記打面への打点位置に応じて互いの間の抵抗値の比率が変化する第２及び第３の電極とを、備えたものである。

また、第２及び第３の電極にそれぞれ固定抵抗器の一端を接続し、他端を相互に接続し、第１電極と上記固定抵抗器の相互接続点との間に定電流源を接続し、上記固定抵抗器間の電圧及び上記定電流源間の電圧に基づいて打点位置及び打撃強度を検出することもできる。

［作用］

打面上の任意の位置を打撃すると、打撃された打面の下方に位置している感圧抵抗素子の部分が抵抗面に接触する。この接触によって、抵抗面に設けられた第２及び第３の電極間の抵抗値の比率が変化する。また、このときの打撃力に応じて、感圧抵抗素子の抵抗値も変化する。従って、第２及び第２の電極間の抵抗値の比率変化を検出することによって打撃位置を検出することができ、感圧抵抗素子の抵抗値の変化を検出することによって打撃強度を検出することができる。

このような第２及び第３の電極間の抵抗値の比率変化と、感圧抵抗素子の抵抗値の変化を検出するために、上

述したように抵抗器や定電流源が用いられている。

［実施例］

第２図は、本発明による電子打楽器の第１の実施例のブロック図で、この実施例は同図に示すように打撃部２を有している。この打撃部２は、中央にヘッド部４を有し、その外周囲にリム部６を有している。ヘッド部４は、第３図に示すようにボディ８に、ばね、ゴム等の緩衝部材10を介して支持されており、下側よりベース12、ベッド部センサ14、ゴム等のパッド16からなる。また、リム部６は、下からリム部センサ18、ゴム等のパッド20からなる。

第１図にヘッド部センサ14の詳細な縦断面図を示す。このヘッド部センサ14は最下層にフィルム等によって円形に形成した絶縁体22を有し、その上面にカーボン等からなる円形の抵抗面24が張り合わされている。この抵抗面24の円周部には環状の電極26が設けられている。また、この抵抗面24の中心にも電極28が設けられている。これら電極26、28は、例えば銀箔等の導体によって構成されている。この抵抗面24と間隔を隔てて上方に円形の感圧抵抗素子30が設けられている。この間隔を隔てるために、抵抗面24と感圧抵抗素子30との間に環状のスペーサ32が設けられている。なお、スペーサ32としては、環状のもの以外にドット状のものも使用することができる。感圧抵抗素子30の上面には、円形の電極34が張り合わされている。この電極34も銀箔等の導体によって形成されている。さらに、この電極34の上面には、可撓性のあるフィルムからなる円形の打面36が張り合わされている。

このようなヘッド部センサ14の打面36を例えば第４図に示すようにスティック38で打撃すると、打撃位置に対応する打面36、電極34及び感圧抵抗素子30が撓み、感圧抵抗素子30が抵抗面24に接触する。このときの打撃強度に応じて第５図に示すように感圧抵抗素子30の抵抗値R1が変化する。また、打撃位置、即ち感圧抵抗素子30が抵抗面24に接触する位置の変更によって電極26、28間に構成される抵抗値R2、R3の比率が変化する。

このような抵抗値R1、R2、R3の変化を検出するために、電極26、28、34は強さ・位置分離回路40に接続されている。この強さ・位置分離回路40を第６図に示す。この強さ・位置分離回路40は、電極26、28にそれぞれ一端を接続した固定抵抗器42、44を有し、これらの他端を相互に接続し、この相互接続点と電極34との間に定電流源46を接続したものである。なお、固定抵抗器42、44の抵抗値は、等しくかつR2、R3よりも比較的大きな値とすることが望ましい。

このような回路において、例えば抵抗器44間の電圧V_Aは、抵抗器42、44の抵抗値をＲ、定電流源46からの電流をI_sとすると、

$$V_A = \frac{(R + R3)\,R}{2R + R2 + R3}\,I_s$$

で表わされる。ここでR2＋R3の値は一定であるので、R3の値の変化に応じてVAが変化する。R3、R2の比率は上述したように打撃位置の変化によって変化するので、R3の値も打撃位置に応じて変化する。従って、VAを測定することによって打撃位置を検出することができる。なお、

$$V_F = \left\{R1 + \frac{(R + R2)\,(R + R3)}{2R + R2 + R3}\right\} I_s$$

で求められる。ここで、Rの値をR2、R3に比較して大きく設定しているので、

$V_F \fallingdotseq (R1 + R/2)\,I_s$

とみなせる。ここで、R/2の値は一定でかつ、R1の変化は上述したように打撃強度に比例しているので、VFを測定し、その測定値から（R/2）Isを減算することによって打撃強度を測定することができる。なお、Rの値をR2、R3に比較して大きく設定できない場合には、電極26、28間の電圧をVDとし、理想的な打撃強度に対応する電圧をV0とした場合、

$V_0 = V_F - a \times |V_D|$

の演算を行なうことによって理想的に打撃強度を測定することができる。ここで、aは係数で、抵抗面24の抵抗値やRにより最適値は変化するので、これら回路定数を設定した後に、上式を満足するようにaを設定すればよい。

このようにして測定されたVA、VFは、第２図に示すA/D変換器47によってディジタル信号に変換されて、CPU48に供給される。なお、V0を演算する場合には、VF、VDをA/D変換器47によってディジタル信号に変換した後に、CPU48によって上述した式に基づいてV0を算出する。

リム部センサ18も、基本的にはヘッド部センサ14と同様に構成されている。但だし、第７図に示すように絶縁体22a、抵抗面24a、感圧抵抗素子30a、電極34a、打面36aがそれぞれ環状に形成されている点と、第８図に示すように電極26a、28aが抵抗面24aの両端に設けられている点が異なる。これら各電極2a、28a、34aは、上述した強さ・位置分離回路40と同一の構成の強さ・位置分離回路40aに接続され、強さ・位置分離回路40aによって打撃強度、打撃位置が検出され、A/D変換器47によってディジタル信号に変換されて、CPU48に供給される。

CPU48は、このようにして供給されたヘッド部センサ14及びリム部センサ18からの打撃強度情報及び打撃位置情報に基づいて音源50を制御して、打撃強度及び打撃位置に応じた楽音を発生させる。通常、音源50には音の種類、音の大きさ、音程、音質等のパラメータがあるが、打撃強度及び打撃位置情報を、これらパラメータに自由に割り当てて、楽音を発生させる。また、リム部６とヘッド部４とを同時に打撃したときには、それぞれ別のパラメータに、これらリム部６からの打撃強度及び打撃位置情報と、ヘッド部４からの打撃強度情報及び打撃位置情報を割り当てると、アコースティックなドラムを叩いたときと同じ様な楽音が得られる。この楽音はAMP52で増幅された後に、スピーカ54より拡声される。なお、56は、CPU48が実行するプログラムが記憶されているROM、58はCPU48がプログラムを実行する際にデータの授受を行なうRAMである。

同様に抵抗器42間の電圧を測定することによっても、打撃位置を検出することができる。

また、抵抗器42、44の他端の相互接続点と電極34との間の電圧VFは、

第２の実施例を第９図及び第10図に示す。この実施例は、第10図に示すように抵抗面24bの中心に設けた電極28bを外部に引出線60を用いて引き出したものである。その製造は、次のように行なわれる。まず第９図（ａ）に示すように引出部62を有する絶縁フィルム22の中心に電極28bを印刷すると共に、この電極28bから引出部62に向って直線状に引出線60を印刷する。次に同図（ｂ）に示すように引出線60における抵抗面24b上にある部分を絶縁するために印刷を行なう。64がその絶縁印刷部である。次に同図（ｃ）に示すように抵抗面22bの周縁部に環状に電極26bを印刷すると共に、この電極26bの引出線66も印刷する。そして、同図（ｄ）に示すようにカーボンを印刷して抵抗面24bを形成し、併せて引出線60、66の上にも、これらに接続されるコネクタ部保護のためカーボンを上塗する。68、70が、その上塗部である。なお、第10図では、各電極26b、28b、引出線60、66、絶縁印刷部64、抵抗面24b等の関係の理解を容易にするために、これらの厚さをかなり誇張して描いてあるので、抵抗面24b上にかなりの段差が生じるように思えるが、実際にはこれらの厚みはマイクロミリのオーダであるのに対し、抵抗面24bの直径は数センチのオーダであるので、実際に生じる段差はマイクロミリオーダのもので動作上問題は生じない。この第２の実施例のように絶縁フィルムの中心から電極28bを引き出す場合に、引出線60、66等を絶縁フィルム22b上にパターンを印刷することによって形成すると、構造の単純化が図れる上にコストを軽減することができる。

［発明の効果］

以上のように、本発明による電子打楽器によれば、打撃した際に感厚抵抗素子が抵抗面に接触する構成であるので、打撃した際の打撃位置に応じて第２及び第３の電

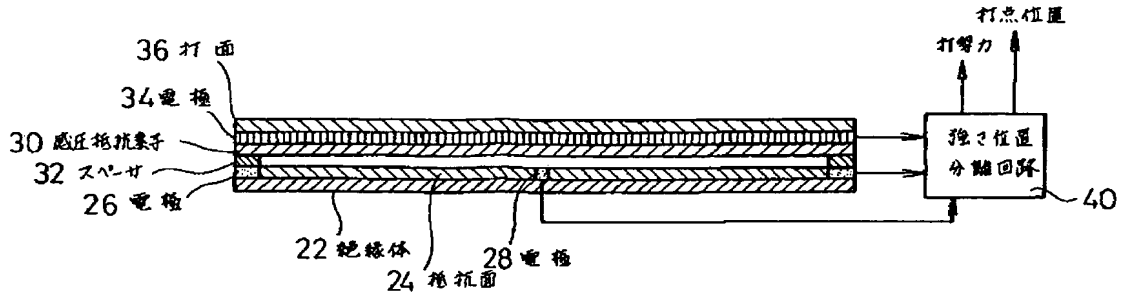
極間の抵抗の比率が変化し、打撃位置を検出することができる。従って、打面の任意の位置を打撃しても、打面の中心位置からの距離を打撃位置として検出することができるので、より実用的な電子打楽器を供給できる。また、打撃強度に応じて感圧抵抗素子の抵抗値が変化するので、この変化を検出することによって打撃強度を検出することができる。従って、本発明によれば、打撃強度と打撃強度を同時に検出することができる。しかも、このような打撃位置や打撃強度の検出に必要な回路は、１つの定電流源と２つの固定抵抗器だけであるので、回路構成を簡略化することができる。

【図面の簡単な説明】

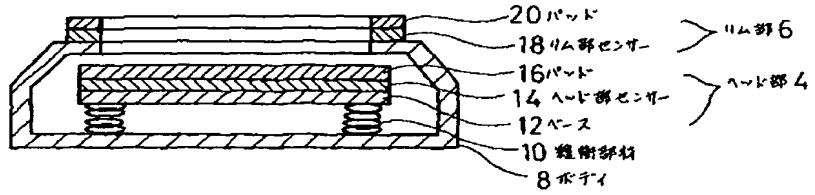
第１図は本発明による電子打楽器の第１の実施例のヘッド部のセンサの縦断面図、第２図は同第１の実施例のブロック図、第３図は同第１の実施例の打撃部の縦断面図、第４図は第１図のヘッド部センサを打撃した状態を示す縦断面図、第５図は第１図のヘッド部センサが打撃された際の等価回路図、第６図は第１の実施例の強さ・位置分離回路の回路図、第７図は第１の実施例のリム部センサの部分省略破断斜視図、第８図は第７図のリム部センサの抵抗面の平面図、第９図（ａ）乃至（ｄ）は第２の実施例の電極及び抵抗面の製造過程を示す図、第10図は第９図（ｄ）のＡ－Ａ′線に沿う断面図である。

24……抵抗面、26、28……第２及び第３の電極、30……感圧抵抗素子、34……第１の電極、36……打面、42、44……固定抵抗器、46……定電流源。

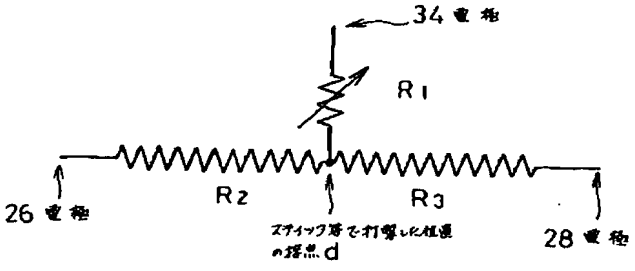
【第１図】



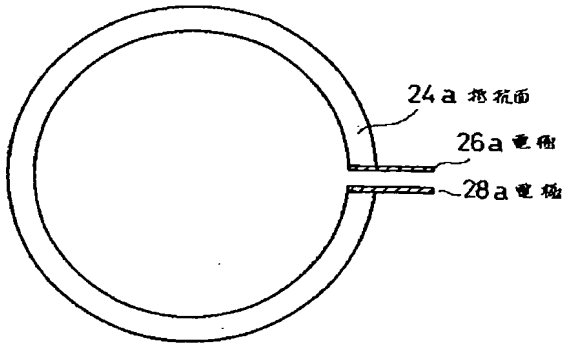
【第３図】



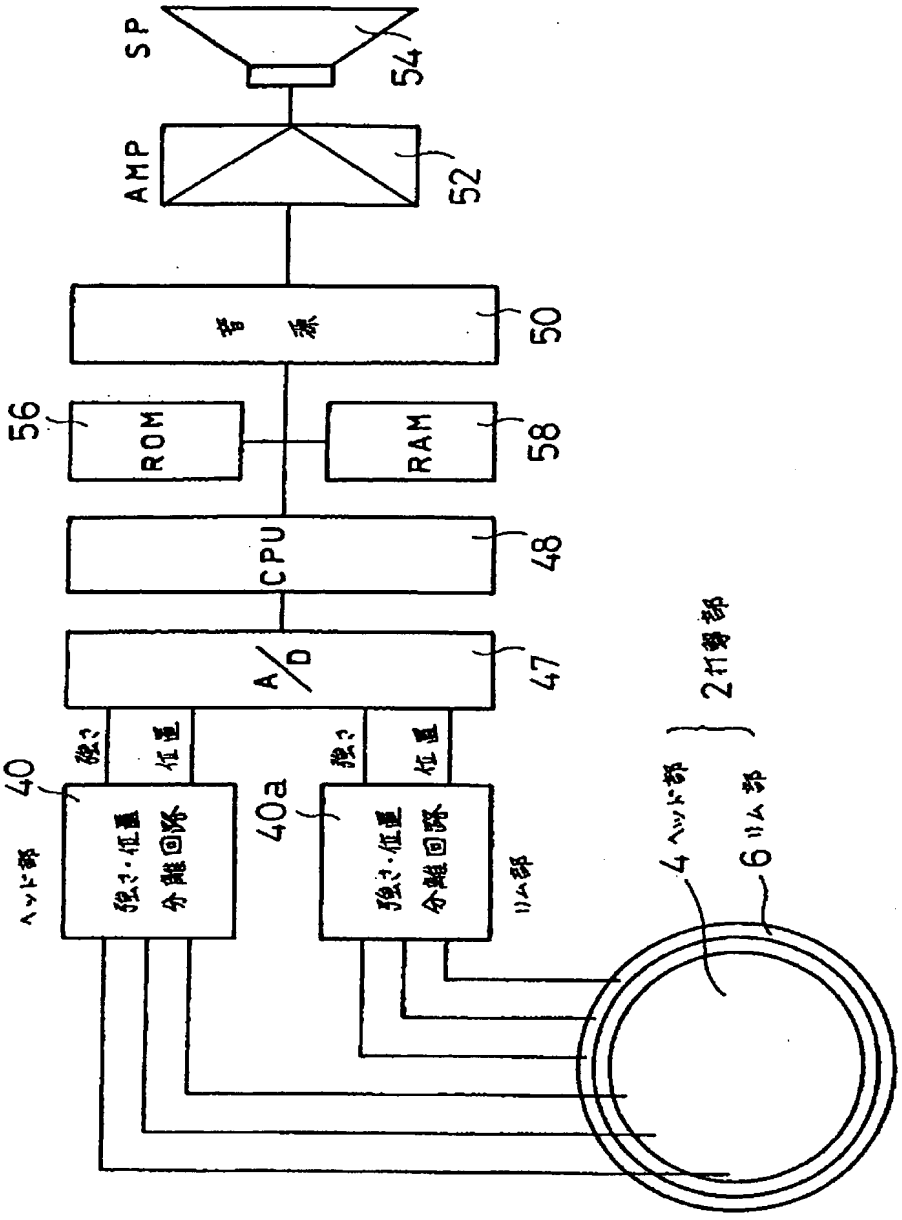
【第５図】



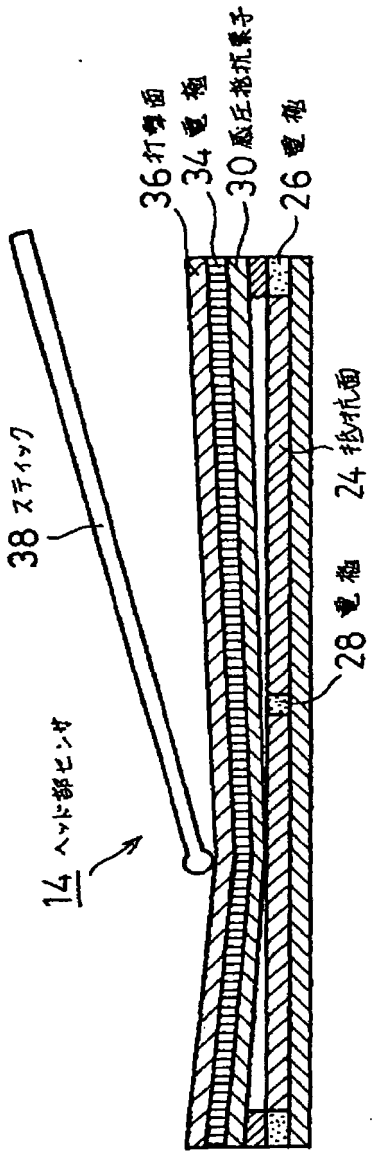
【第８図】



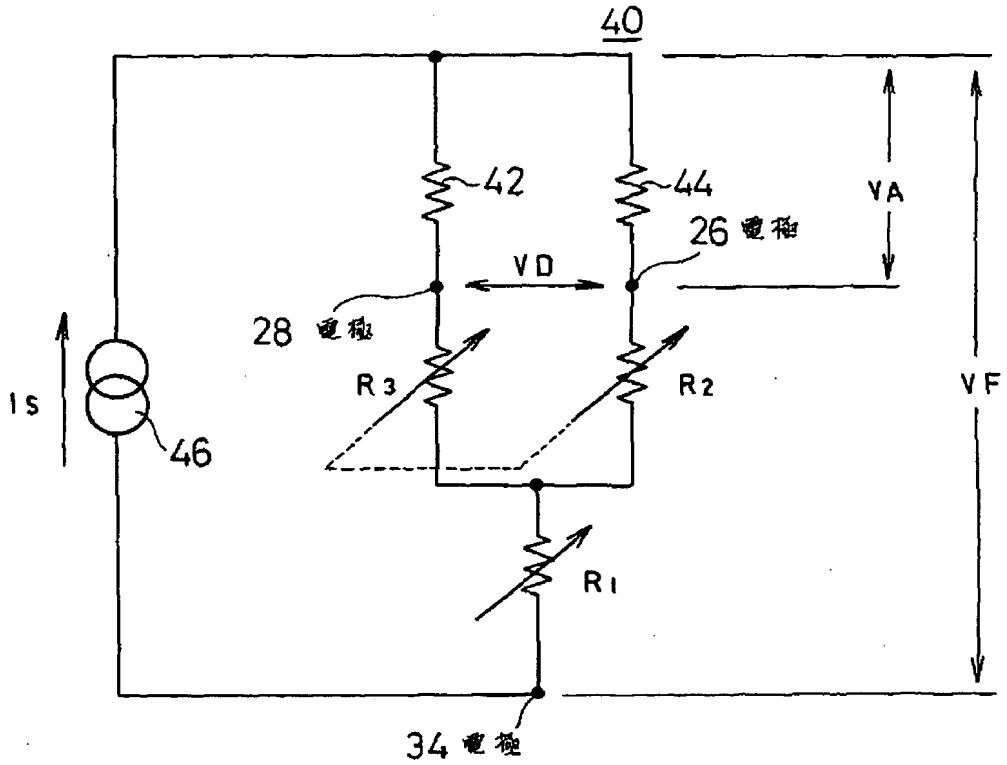
【第２図】


SP
54
AMP
52
音源
50
56
ROM
RAM
58
CPU
48
A/D
47
2行程部
強さ
位置
40
40a
強さ・位置
分離回路
ヘッド部
リム部
4 ヘッド部
6 リム部

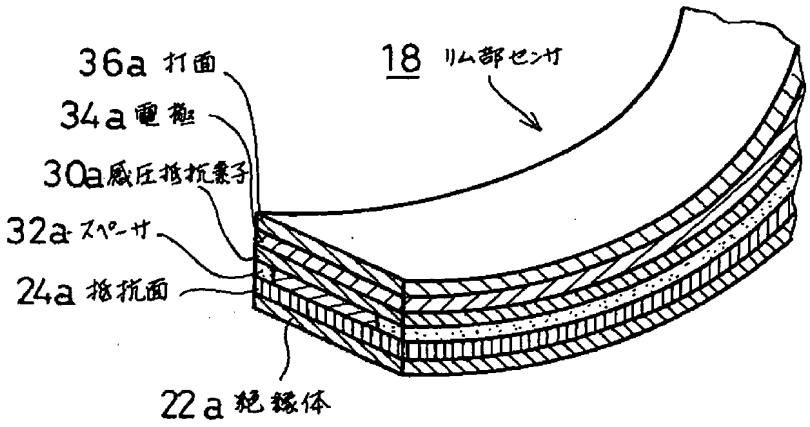
【第４図】



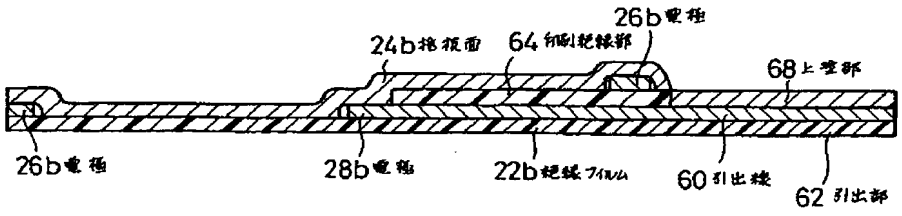
【第６図】


40
42
44
VA
26 電極
VD
28 電極
R3
R2
VF
IS
46
R1
34 電極

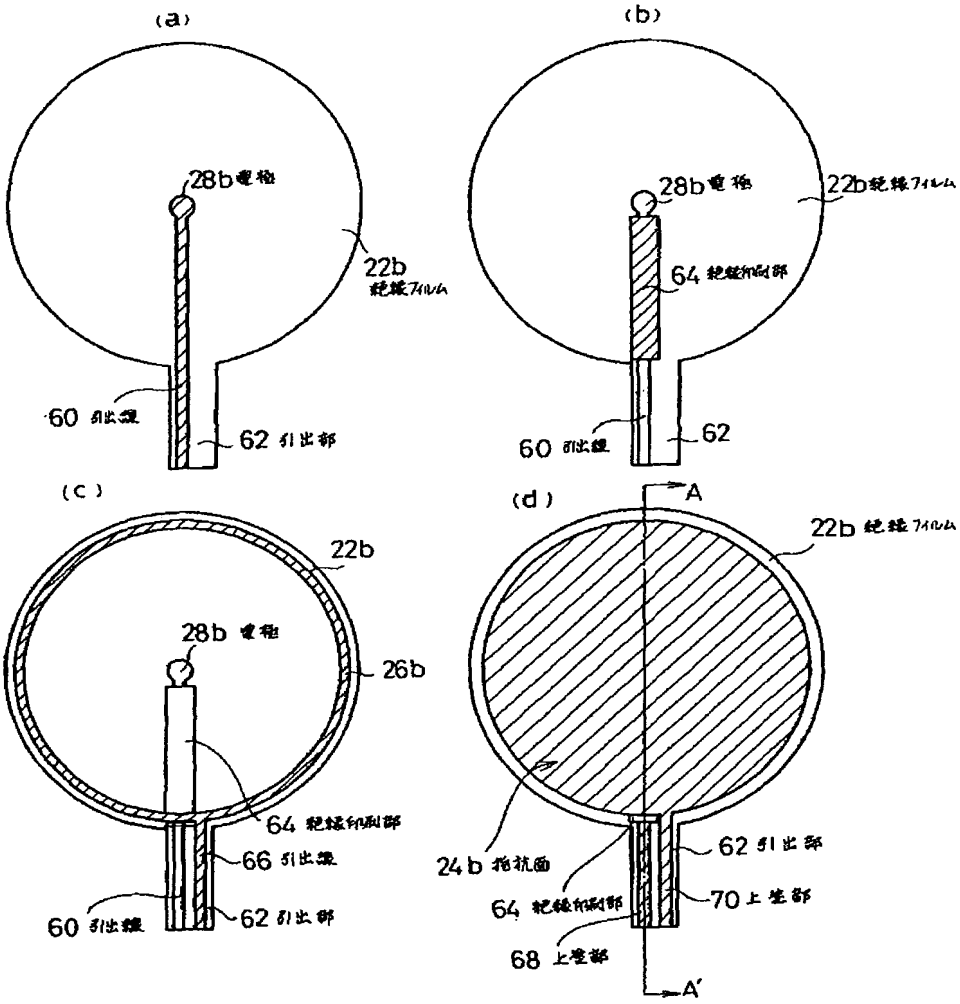
【第７図】


36a 打面
18 リム部センサ
34a 電極
30a 感圧抵抗素子
32a スペーサ
24a 抵抗面
22a 絶縁体

【第１０図】


26b 電極
24b 抵抗面
64 印刷配線部
68 上面部
26b 電極
28b 電極
22b 絶縁フィルム
60 引出線
62 引出部

【第９図】


(a)
28b 重錘
22b 絶縁フィルム
60 引出線
62 引出部
(b)
28b 重錘
22b 絶縁フィルム
64 絶縁印刷部
60 引出線
62
(c)
22b
28b 重錘
26b
64 絶縁印刷部
66 引出線
60 引出線
62 引出部
(d)
A
22b 絶縁フィルム
24b 抵抗面
62 引出部
64 絶縁印刷部
70 上塗部
68 上塗部
A'

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 03-107900
(43)Date of publication of application : 08.05.1991

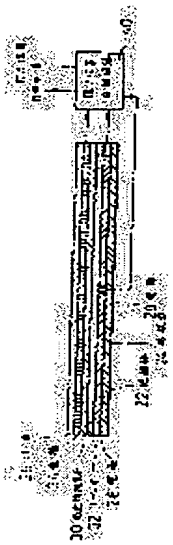
(51)Int.CI. G10H 1/34
G10H 1/053

(21)Application number : 01-245841
(22)Date of filing : 21.09.1989

(71)Applicant : ROLAND CORP
(72)Inventor : YAMASHITA YUJI

(54) ELECTRONIC PERCUSSION INSTRUMENT

(57)Abstract:
PURPOSE: To allow the simultaneous detection of striking intensity and striking positions by successively sticking a 1st electrode, a pressure sensitive resistant element, and resistance surface under a striking surface and providing 2nd and 3rd electrodes on this resistance surface.
CONSTITUTION: The 1st electrode 34, the pressure sensitive resistant element 30 and the resistance surface 24 are successively stuck onto the rear surface of the striking surface 36 and the 2nd and 3rd electrodes 26, 28 are provided on the resistance surface 24. The part of the pressure sensitive resistant element 30 positioned below the striking surface given with the blow comes into contact with the resistance surface 24 when the arbitrary position on the striking surface 36 is struck. The ratio of the resistance value between the 2nd, and 3rd electrodes 26 and 28 provided on the resistance surface 24 is then changed and the resistance value of the pressure sensitive resistant element 30 is changed as well according to the striking force of this time. The striking position is detected by detecting the change in the ratio of the resistance value between the 2nd and 3rd electrodes 26 and 28 of this time. The striking intensity is simultaneously detected by detecting the change in the resistance value of the pressure sensitive resistant element 30.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

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(57) [Claim(s)]
[Claim 1] The 1st electrode which the player made the face which deals a blow, and the undersurface of this face rival, The pressure-sensitive resistance element from which it is made to rival by the undersurface of this 1st electrode, and resistance changes according to the blow intensity to the above-mentioned face, The electronic percussion instrument possessing the resistance side established in the lower part of this pressure-sensitive resistance element, and the 2nd from which it is prepared in this resistance side, and the ratio of resistance changes according to the RBI position to the above-mentioned face while it is mutual, and 3rd electrodes.
[Claim 2] The electronic percussion instrument which connects the end of a fixed resistor to the 2nd and 3rd electrodes, respectively, connects the other end mutually in an electronic percussion instrument according to claim 1, connects a constant current source between the 1st electrode and the interchange point of the above-mentioned fixed resistor, and detects an RBI position and blow intensity based on the voltage between the above-mentioned fixed resistors, and the voltage between the above-mentioned constant current sources.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Industrial Application]
Especially this invention relates to what detects blow intensity and a blow position about an electronic percussion instrument.
[Description of the Prior Art]
Conventionally, in an electronic percussion instrument, there is a thing which is indicated by JP,52-46731,Y and JP,56-126893,A, for example to detect a blow position. By separating an interval, arranging a field resistor and an electric conduction film, hitting an electric conduction film, and contacting an electric conduction film to a field resistor, the technology of JP,52-46731,Y changes the resistance between an electric conduction film and a field resistor, and detects a blow position. moreover, the technology of JP,56-126893,A forms the sensor for two or more blow position detection, and a blow position is detected by these any were hit Moreover, there is a thing currently indicated by the ****** No. 501653 [62 to] official report to detect a blow position and blow intensity. This carries out the laminating of a conductive layer, a pressure sensitive device, and the resistance sheet to the order of a lower shell, change of the resistance of the resistance sheet at the time of hitting a resistance sheet detects detection of a blow position, and resistance change of a pressure sensitive device detects change of blow intensity.
[Problem(s) to be Solved by the Invention]
However, according to the technology of JP,52-46731,Y and JP,56-126893,A, although detection of a blow position was completed, detection of blow intensity had the trouble that it could not do. Moreover, according to the technology of a ****** No. 501653 [62 to] official report, although blow intensity and the blow position were detectable, since only single direction (for example, the direction of X-X') was able to detect a blow position, it had the trouble that the blow position of other directions (for example, the direction of Y-Y') which are not practical was undetectable. Moreover, although detection of blow intensity or a blow position was performed by detecting change of the resistance of a resistance sheet or a pressure sensitive device therefore, there was also a trouble that the power supply for blow position detection and the power supply for blow on-the-strength detection were required according to an individual, and circuitry became complicated. this invention aims at offering the electronic percussion instrument which solved each above-mentioned trouble.
[The means for solving a technical problem]
The face to which, as for this invention, a player deals a blow in order to attain the above-mentioned purpose, The 1st electrode which made the undersurface of this face rival, and the pressure-sensitive resistance element from which it is made to rival by the undersurface of this 1st electrode, and resistance changes according to the blow intensity to the above-mentioned face, It is prepared in the resistance side established in the lower part of this pressure-sensitive resistance element, and this resistance side, and according to the RBI position to the above-mentioned face, while it is mutual, it has the 2nd from which the ratio of resistance changes, and 3rd electrodes.
Moreover, the end of a fixed resistor can be connected to the 2nd and 3rd electrodes, respectively, the other end can be connected mutually, a constant current source can be connected between the 1st electrode and the interchange point of the above-mentioned fixed resistor, and an RBI position and blow intensity can also be detected based on the voltage between the above-mentioned fixed

resistors, and the voltage between the above-mentioned constant current sources.
[Function]
A blow of the arbitrary positions on a face contacts the portion of the pressure-sensitive resistance element located under the hit face to a resistance side. The ratio of the 2nd prepared in the resistance side and 3rd inter-electrode resistance changes with these contact. Moreover, the resistance of a pressure-sensitive resistance element also changes according to the striking power at this time. Therefore, blow intensity is detectable by being able to detect a blow position and detecting change of the resistance of a pressure-sensitive resistance element by detecting ratio change of the 2nd and 2nd inter-electrode resistance.
In order to detect such ratio change of the 2nd and 3rd inter-electrode resistance, and change of the resistance of a pressure-sensitive resistance element, as mentioned above, the resistor and the constant current source are used.
[Example]
A view 2 is a block diagram of the 1st example of the electronic percussion instrument by this invention, and this example has the blow section 2, as shown in this drawing. This blow section 2 has the head section 4 in the center, and has the rim section 6 in the periphery enclosure. the head section 4 is shown in a view 3 -- as -- the body 8 -- the buffer of a spring, rubber, etc. -- it is supported through the member 10 and consists of pads 16, such as the base 12, the bed section sensor 14, and rubber, from the bottom Moreover, the rim section 6 consists of pads 20, such as the lower shell rim section sensor 18 and rubber.
Detailed drawing of longitudinal section of the head section sensor 14 is shown in a view 1. This head section sensor 14 has the insulator 22 circularly formed with the film etc. at the lowest layer, and the circular resistance side 24 which consists of carbon etc. on the upper surface is made to rival in it. The annular electrode 26 is formed in the periphery section of this resistance side 24. Moreover, the electrode 28 is formed also in the center of this resistance side 24. These electrodes 26 and 28 are constituted by conductors, such as silver leaf. This resistance side 24 and interval are separated and the circular pressure-sensitive resistance element 30 is formed up. In order to separate this interval, the annular spacer 32 is formed between the resistance side 24 and the pressure-sensitive resistance element 30. In addition, as a spacer 32, a dot-like thing can also be used in addition to an annular thing. The circular electrode 34 is made to rival by the upper surface of the pressure-sensitive resistance element 30. This electrode 34 is also formed of conductors, such as silver leaf. Furthermore, the circular face 36 which consists of a film with flexibility is made to rival by the upper surface of this electrode 34.
In the face 36 of such a head section sensor 14, if it hits with a stick 38 as shown in the 4th view , the face 36 corresponding to a blow position, an electrode 34, and the pressure-sensitive resistance element 30 will bend, and the pressure-sensitive resistance element 30 will contact the resistance side 24. As shown in a view 5 according to the blow intensity at this time, the resistance R1 of the pressure-sensitive resistance element 30 changes. Moreover, the ratio of an electrode 26 and the resistance R2 and R3 constituted among 28 changes with change of a blow position, i.e., the position where the pressure-sensitive resistance element 30 contacts the resistance side 24.
In order to detect change of such resistance R1, R2, and R3, electrodes 26, 28, and 34 are connected to strength and the position separation circuit 40. This strength and position separation circuit 40 are shown in a view 6. This strength and position separation circuit 40 have the fixed resistors 42 and 44 which connected the end to electrodes 26 and 28, respectively, connects these other ends mutually, and connects a constant current source 46 between this interchange point and electrode 34. In addition, as for the resistance of fixed resistors 42 and 44, it is desirable to consider as an equal and, comparatively bigger value than R2 and R3.
If the voltage VA between resistors 44 sets R and the current from a constant current source 46 to Is for the resistance of resistors 42 and 44 in such a circuit

$$V_A = \frac{(R + R3)\,R}{2R + R2 + R3}\,I_s$$

It is come out and expressed. Since the value of R2+R3 is fixed here, VA changes according to the value change of R3. Since the ratio of R3 and R2 changes with change of a blow position as

mentioned above, the value of R3 also changes according to a blow position. Therefore, a blow position is detectable by measuring VA. In addition, a blow position is detectable also by measuring the voltage between resistors 42 similarly.
Moreover, voltage VF between the interchange point of the other end of resistors 42 and 44, and an electrode 34, $V_F = \{ R1 + \frac{(R+R2)(R+R3)}{2R+R2+R3} \} I_s$

It comes out and asks. Here, since the value of R is greatly set up as compared with R2 and R3, it can be regarded as VF**(R1+R/2) Is. Here, R/2 of values are fixed, and since change of R1 is proportional to blow intensity as mentioned above, VF can be measured and blow intensity can be measured by subtracting Is from the measured value (R/2). In addition, when the value of R cannot be greatly set up as compared with R2 and R3, voltage between an electrode 26 and 28 was set to VD and voltage corresponding to ideal blow intensity is set to VO Blow intensity can be ideally measured by calculating VO=VF-ax|VD|., What is necessary is here, for a to be a coefficient, and just to set up a so that an upper formula may be satisfied after setting up these circuit constants since an optimum value changes with the resistance of the resistance side 24, or R.
Thus, measured VA and VF are changed into a digital signal by A/D converter 47 shown in a view 2, and are supplied to CPU48. In addition, in calculating VO, after changing VF and VD into a digital signal by A/D converter 47, based on the formula mentioned above by CPU48, it computes VO.
The rim section sensor 18 as well as the head section sensor 14 is constituted fundamentally. It **** and the point that insulator 22a, resistance side 24a, pressure-sensitive resistance-element 30a, electrode 34a, and face 36a are formed in annular, respectively as shown in a view 7 differs from the point that Electrodes 26a and 28a are formed in the ends of resistance side 24a as shown in a view 8. It connects with the strength and position separation circuit 40a of the same composition as the strength and the position separation circuit 40 mentioned above, and blow intensity and a blow position are detected by strength and position separation circuit 40a, and each [these] electrodes 2a, 28a, and 34a are changed into a digital signal by A/D converter 47, and are supplied to CPU48.
CPU48 controls a sound source 50 based on the blow on-the-strength information and blow positional information from the head section sensor 14 supplied by doing in this way, and the rim section sensor 18, and generates the musical sound according to blow intensity and the blow position. Usually, although there are parameters, such as a kind of sound, a loudness level, a pitch, and tone quality, in a sound source 50, blow intensity and blow positional information are freely assigned to these parameters, and musical sound is generated. Moreover, if blow intensity and blow positional information, and the blow on-the-strength information and blow positional information from the head section 4 from these rim section 6 are assigned to a respectively different parameter when the rim section 6 and the head section 4 are hit simultaneously, the same musical sound as the time of striking an acoustic drum will be acquired. After this musical sound is amplified by AMP52, it is ****(ed) from a loudspeaker 54. In addition, ROM the program whose CPU48 performs 56 is remembered to be, and 58 are RAM which delivers and receives data, in case CPU48 performs a program.
The 2nd example is shown in a view 9 and the 10th view. Outside, a leader line 60 is used for this example, and it pulls out electrode 28b prepared in the center of resistance side 24b as shown in a view 10. The manufacture is performed as follows. As first shown in a view 9 (a), while printing electrode 28b at the center of the insulating film 22 of having the drawer section 62, a leader line 60 is printed in the shape of a straight line toward the drawer section 62 from this electrode 28b. Next, it prints in order to insulate the portion on resistance side 24b in a leader line 60, as shown in this drawing (b). 64 is the insulating printing section. Next, as shown in this drawing (c), while printing electrode 26b annularly in the periphery section of resistance side 22b, the leader line 66 of this electrode 26b is also printed. And carbon is recoated for the connector area protection which prints carbon, forms and combines resistance side 24b, and is connected to these also on leader lines 60 and 66 as shown in this drawing (d). 68 and 70 are the glazing section. In addition, since remarkable exaggeration of such thickness is carried out and it has drawn, in order to make easy an understanding of relations, such as each electrodes 26b and 28b, leader lines 60 and 66, the insulating printing section 64, and resistance side 24b, although it seems to produce a remarkable

level difference on resistance side 24b in a view 10 In fact, to such thickness being the order of a micro millimeter, since the diameter of resistance side 24b is several cm order, the actually produced level difference is the thing of micro millimeter order, and an operation top problem is not produced. If a leader line 60 and 66 grades are formed by printing a pattern on insulating film 22b when pulling out electrode 28b from the center of an insulating film like this 2nd example, the simplification of structure can be attained upwards and cost can be mitigated.

[Effect of the Invention]

As mentioned above, since according to the electronic percussion instrument by this invention it is the composition that an admiration thick resistance element contacts a resistance side when it hits, according to the blow position at the time of hitting, the 2nd and 3rd ratios of inter-electrode resistance can change, and a blow position can be detected. Therefore, since the distance from the center position of a face is detectable as a blow position even if it hits the positions where a face is arbitrary, a more practical electronic percussion instrument can be supplied. Moreover, since the resistance of a pressure-sensitive resistance element changes according to blow intensity, blow intensity is detectable by detecting this change. Therefore, according to this invention, blow intensity and blow intensity are simultaneously detectable. And since circuits required for detection of such a blow position or blow intensity are only one constant current source and two fixed resistors, they can simplify circuitry.

[Translation done.]

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PRIOR ART

[Description of the Prior Art]
Conventionally, in an electronic percussion instrument, there is a thing which is indicated by JP,52-46731,Y and JP,56-126893,A, for example to detect a blow position. By separating an interval, arranging a field resistor and an electric conduction film, hitting an electric conduction film, and contacting an electric conduction film to a field resistor, the technology of JP,52-46731,Y changes the resistance between an electric conduction film and a field resistor, and detects a blow position. moreover, the technology of JP,56-126893,A forms the sensor for two or more blow position detection, and a blow position is detected by these any were hit Moreover, there is a thing currently indicated by the ****** No. 501653 [62 to] official report to detect a blow position and blow intensity. This carries out the laminating of a conductive layer, a pressure sensitive device, and the resistance sheet to the order of a lower shell, change of the resistance of the resistance sheet at the time of hitting a resistance sheet detects detection of a blow position, and resistance change of a pressure sensitive device detects change of blow intensity.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
Drawing of longitudinal section of the sensor of the head section of the 1st example of the electronic percussion instrument according [a view 1] to this invention, A view 2 the block diagram of this 1st example, and a view 3 Drawing of longitudinal section of the blow section of this 1st example, The representative circuit schematic at the time of the head section sensor of a view 1 being hit, as for drawing of longitudinal section showing the state where the view 4 hit the head section sensor of a view 1, and a view 5, A view 6 the circuit diagram of the strength and position separation circuit of the 1st example, and a view 7 The partial ellipsis fracture perspective diagram of the rim section sensor of the 1st example, The plan of the resistance side of the rim section sensor of a view 7, a view 9 (a), or (d) is drawing octavus showing the electrode of the 2nd example, and the manufacture process of a resistance side, and a cross section with which a view 10 meets the A-A' line of a view 9 (d).
24 [.. A pressure-sensitive resistance element, 34 / .. The 1st electrode, 36 / .. 42 A face, 44 / .. A fixed resistor, 46 / .. Constant current source.] .... 26 A resistance side, 28 .. The 2nd and 3rd electrodes, 30

[Translation done.]

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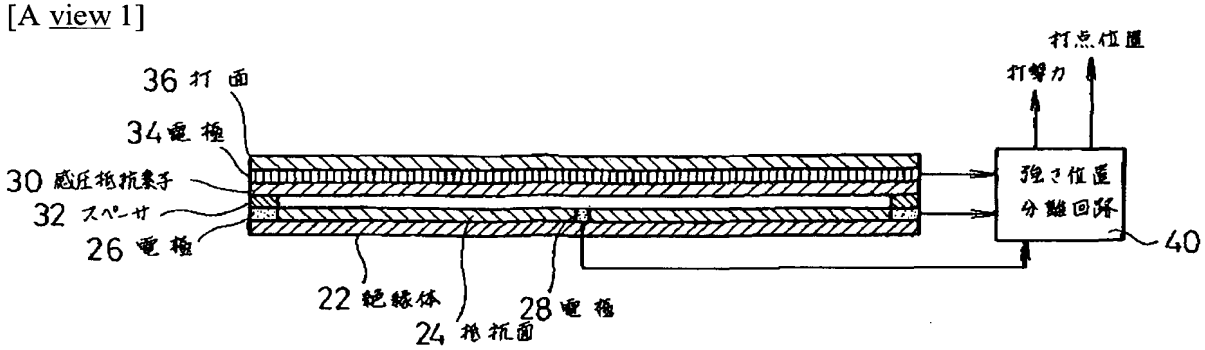
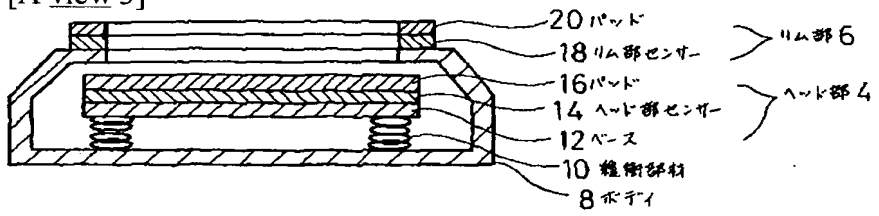
DRAWINGS

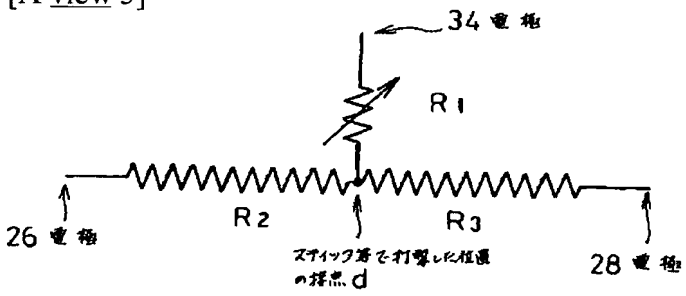
[A view 1]



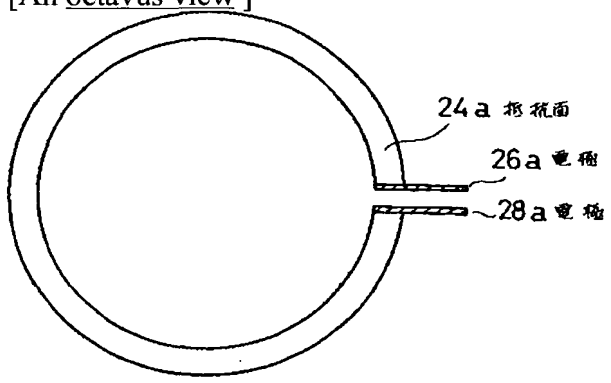
[A view 3]



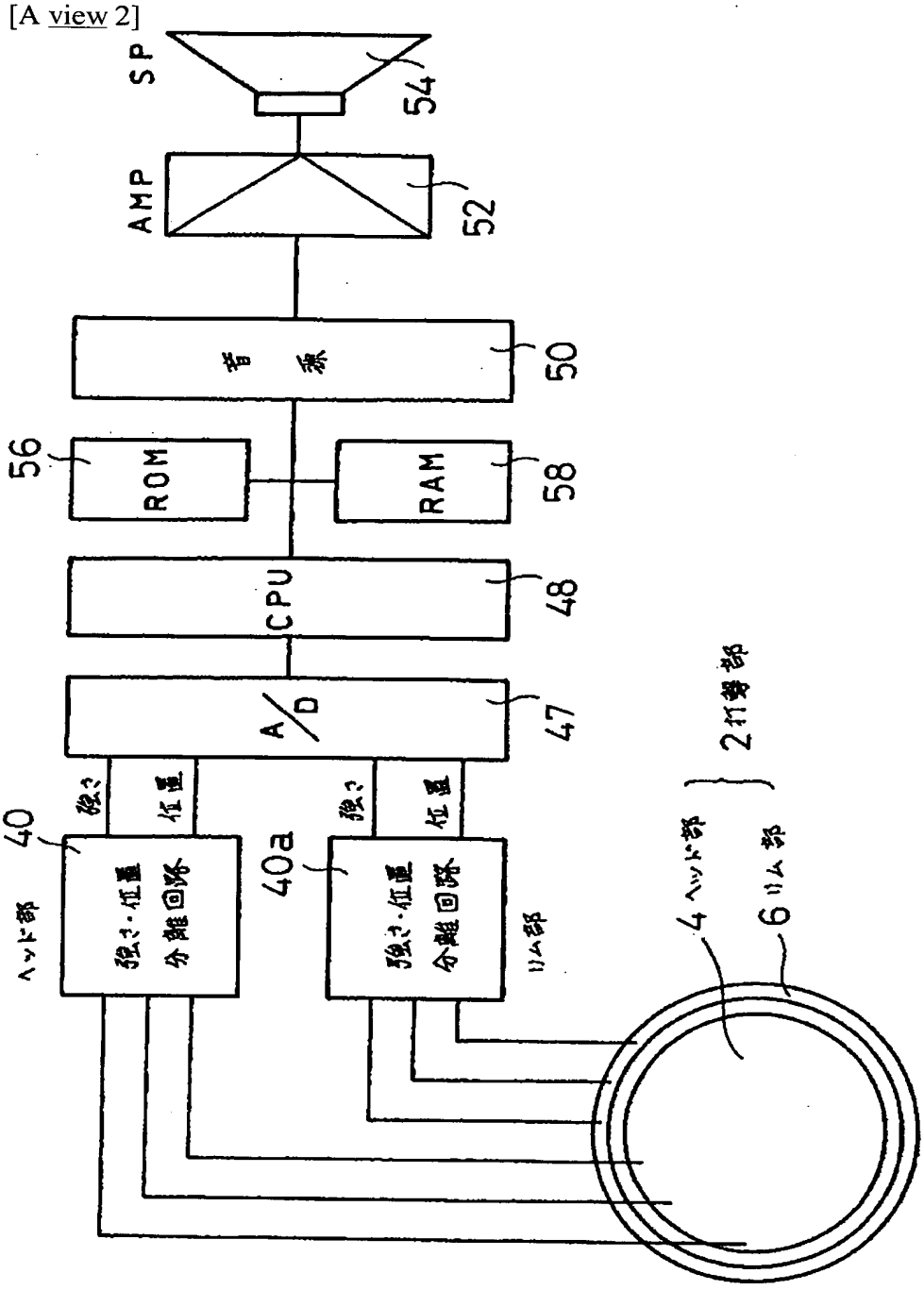
[A view 5]



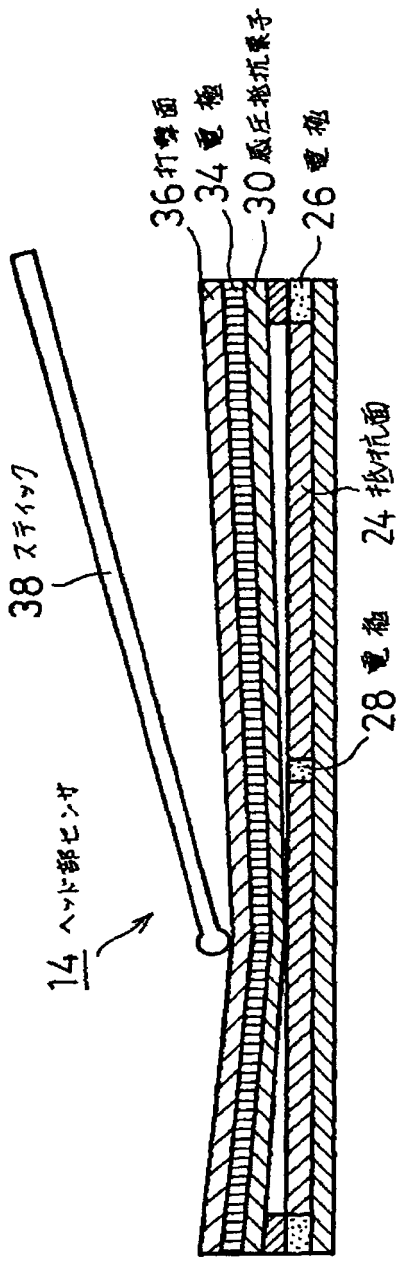
[An octavus view]



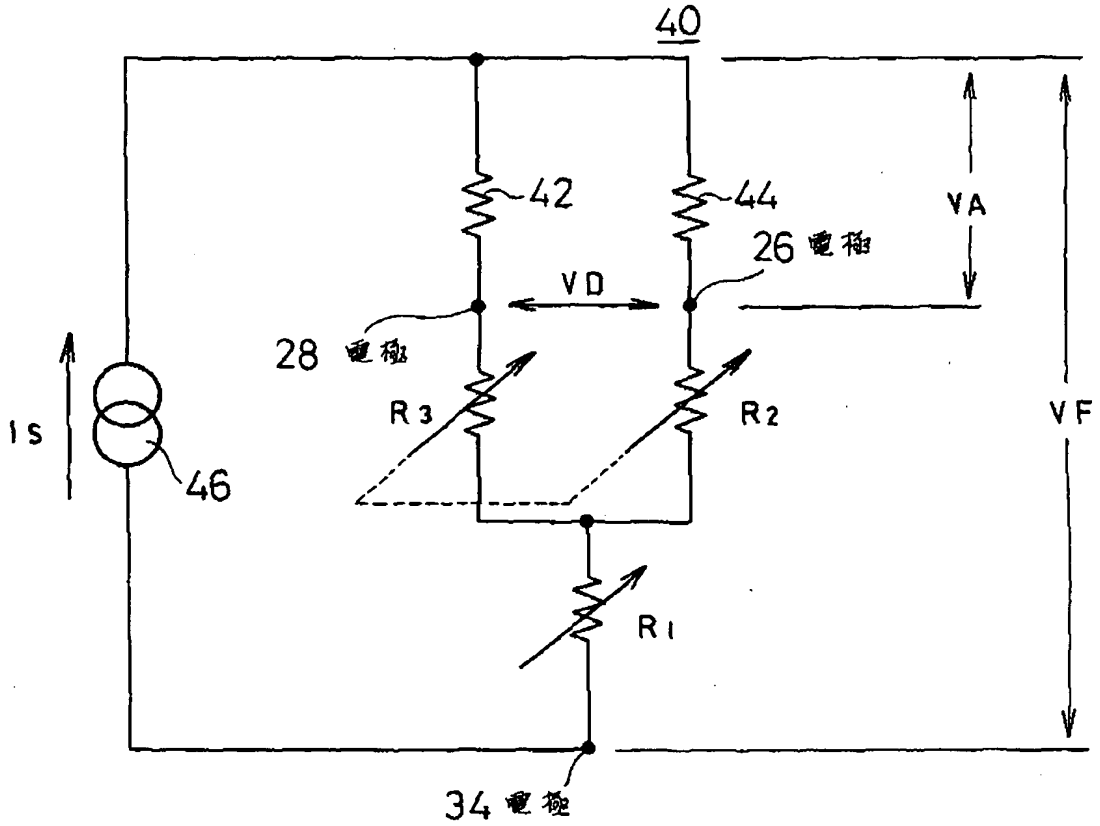
[A view 2]



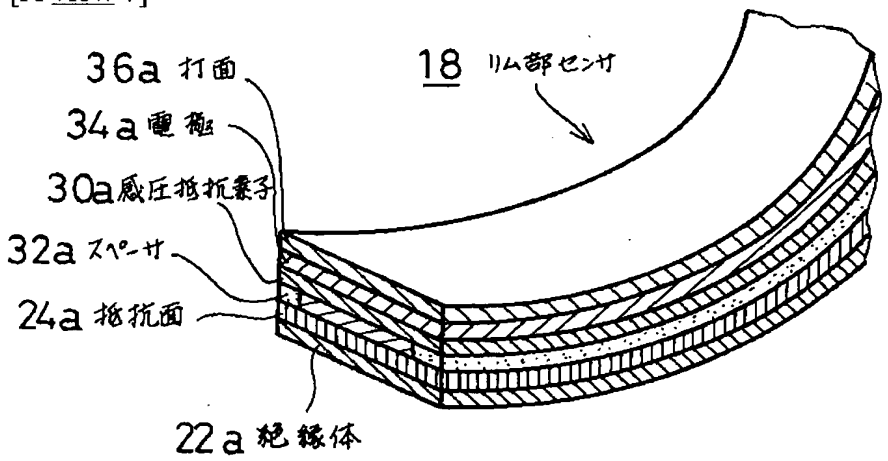
[A view 4]



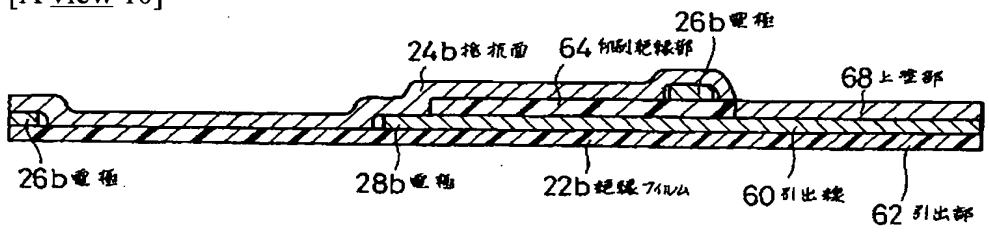
[A view 6]



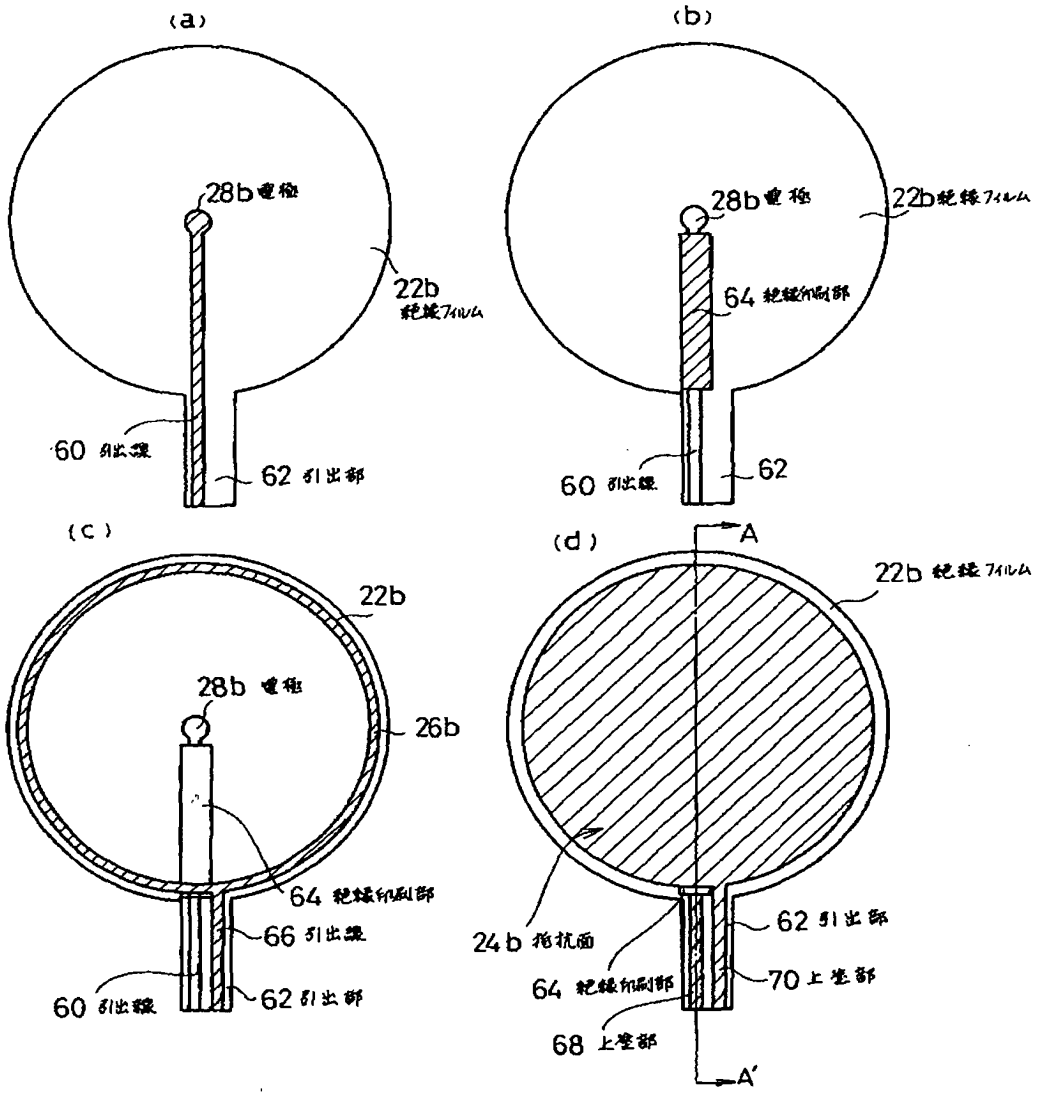
[A view 7]



[A view 10]



[A view 9]



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